

**TWO NEW SPECIES OF *DENNYUS* (*COLLODENNYUS*) CHEWING LICE
(PHTHIRAPTERA: AMBLYCERA: MENOPONIDAE)
FROM SWIFTLETS (APODIFORMES: APODIDAE)**

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Abstract.—The new species *Dennyus* (*Collodennyus*) *mimirogerorum* from the Papuan swiftlet, *Aerodramus papuensis* (Rand), from Papua New Guinea and *D. (C.) bartoni* from the Philippine swiftlet, *A. mearnsi* (Oberholser), from the Philippines are described and illustrated. The genetic distinctiveness of these two species from other close relatives is also evaluated using mitochondrial DNA sequences.

Key Words: chewing lice, *Collodennyus*, *Dennyus*, Phthiraptera, Menoponidae, swiftlet, *Aerodramus*

Following a revision by Clayton et al. (1996) of the chewing lice in the menoponid genus *Dennyus* Neumann and subgenus *Collodennyus* Ledger from swiftlets, we obtained two series of lice from swiftlets in Papua New Guinea and the Philippines. These lice represent new species and are described and illustrated herein.

The characters associated with lice from *Collodennyus*, paraphrased from Clayton et al. (1996), are: Menoponid chewing lice with anterior head margin flattened, never smoothly rounded (Fig. 5). Prosternal plate well developed, with never more than total of 4 setae; first tarsi without claws; sternite I reduced, usually with only 2 setae. Female sternite VII fused with following sternites to form subgenital plate (Fig. 1); setae of VII typically 2 + 4 + 2; each lateroposterior portion of subgenital plate with 4 medium to long submarginal setae (Figs. 2, 6). Male genitalia much as in Fig. 4. These features

will not be repeated under the species description.

For the following descriptions, all measurements were made with an ocular micrometer and are given in millimeters. Abdominal tergal setal counts include the very long lateral setae and all posterior marginal setae between them. Abdominal sternal setae are given as either marginal or anterior, but do not include the 2 very short anterior setae on each side of sternite II and the setae in the brushes on sternites V–VI. The female subgenital plate setae are limited only to those posterior to the portion attributed to sternite VII. Host classification below order follows that of Dickinson (2003).

Partial sequences of the mitochondrial cytochrome oxidase I (COI) gene were obtained for both new species, and these sequences are compared to those of close relatives. Methods for DNA sequencing are described in detail elsewhere (Johnson et al. 2001).

Dennyus (Collodennyus) mimirogerorum
 Clayton, Price, and Johnson,
 new species
 (Figs. 1–5)

Type host.—*Aerodramus papuensis* (Rand), the Papuan swiftlet.

Female.—Head and thorax as in Fig. 5; abdomen as in Fig. 1. Tergal setae: I, 11–12; II, 10–13; III, 12–14; IV–V, 13–14; VI, 12–14; VII, 12; VIII, 12–13; median setae of tergite IV long. Marginal sternal setae: II, 12 (Fig. 3); III, 12–15; IV, 13–16; V, 4–6; VI, 3–4; VII, 8. Anterior sternal setae: II, 8–12; III, 7–12; IV, 11–20; V–VI, 0–2; VII, 0–1. Setae in each brush on sternite V, 42–56; VI, 12–16; with posterior setae thinner and longer than others in brush. Total number of setae on sternite VI, 26–35. Subgenital plate (Fig. 2) with total of 31–35 setae in portion posterior to VII; with 21–22 marginal setae, not thicker than anterior setae and all in highly irregular double row. Anal ventral fringe of 52–57 setae, dorsal of 49–52 setae; total of 9–12 short setae anterior to ventral fringe. Dimensions: temple width, 0.58–0.59; head length, 0.51–0.52; prothorax width, 0.36–0.37; metathorax width, 0.61–0.62; abdomen width at segment IV, 0.83–0.90; abdomen length, 1.87–1.97; total length, 2.90–3.02; anus width, 0.27–0.31.

Male.—As in Fig. 5. Tergal setae: I, 10; II, 12–13; III, 12–14; IV, 13–14; V–VI, 14; VII, 13–14; VIII, 12; median setae of tergite IV long. Marginal sternal setae: II–IV, 10–13; V–VI, 4–6; VII, 7–8; VIII, 6. Anterior sternal setae: II, 3–6; III, 4–8; IV, 4–6; V–VIII, 0. Total number of anterior setae on sternites II–III, 7–14. Setae in each brush on sternite V, 37–40; VI, 11–14; with posterior setae thinner than others in brush. Genitalia (Fig. 4) with well-defined small triangular sac sclerite. Dimensions: temple width, 0.51–0.54; head length, 0.47–0.48; prothorax width, 0.32–0.33; metathorax width, 0.52; abdomen width at segment IV, 0.66; abdomen length, 1.35–1.41; total

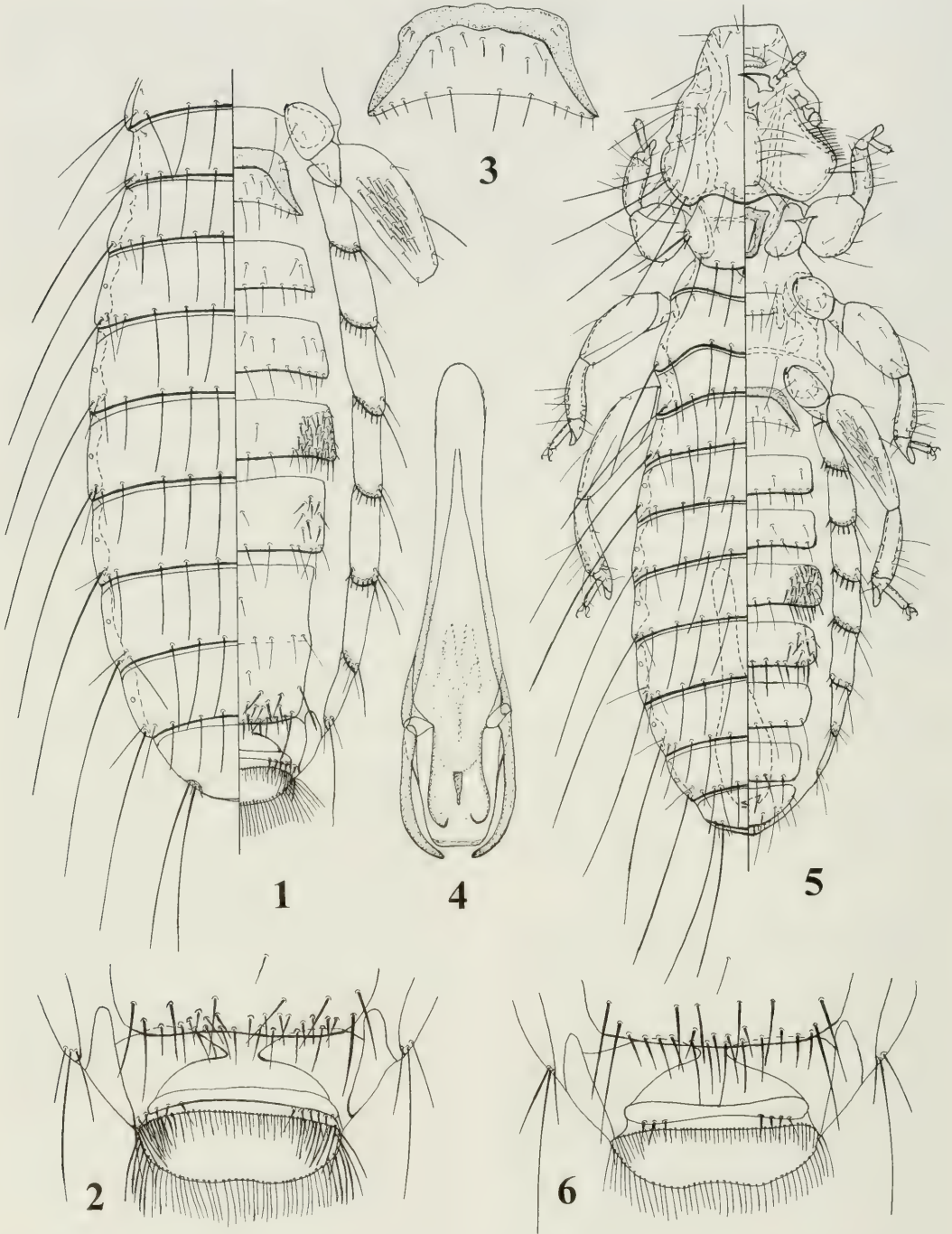
length, 2.29–2.39; genitalia length, 0.68–0.70.

Type material.—Holotype ♀, ex *Aerodramus papuensis*, Papua New Guinea: Losavi Cave, 18 Nov. 2002, D. H. Clayton, SEA 396; in National Museum of Natural History, Washington, D.C. Paratypes: Ex *A. papuensis*, 1 ♂, same data as holotype; 1 ♀, 1 ♂, same except SEA 390; 1 ♀, same except SEA 391.

Remarks.—This new species belongs to the *distinctus* species group and the *elliotti* species subgroup as defined in Clayton et al. (1996). The shape and chaetotaxy of the head as in Fig. 5, in conjunction with the chaetotaxy of the thorax and terminal abdominal segments, place *D. mimirogerorum* in the *distinctus* species group. It is clearly a member of the *elliotti* species subgroup on the basis of the female having a few short setae displaced anterior to the ventral anal fringe and abdominal tergites II–VI each with not more than 14 setae. The male does not show a clearcut separation, but this is not unexpected given the difficulties with male identification for other taxa of *Dennyus*.

The female of *D. mimirogerorum* is distinguished from other taxa in the *elliotti* species subgroup by the combination of its large dimensions, the ventral anal fringe with 9–12 short setae displaced anterior to it (Fig. 2), sternum II with 8–12 anterior setae (Fig. 3), sternites V–VII with 0–2 medioanterior setae, the posterior subgenital plate setae in a very irregular distribution and not stouter than the anterior setae (Fig. 2), and the ventral anal fringe of relatively long setae, especially laterally (Fig. 2). Reference to the key to females given by Clayton et al. (1996) will show *D. mimirogerorum* either going to *D. carljonessi* Clayton et al. in the first part of couplet 8 or by-passing that and progressing to couplet 11, at which point it clearly comes out as being *D. hahnae* Clayton et al. The features mentioned above will separate it from either of those options.

The identification of the male is quite



Figs. 1-6. 1-5, *Dennyus mimirogerorum*. 1, Dorsoventral female abdomen. 2, Ventral female terminalia. 3, Female sternite II. 4, Male genitalia. 5, Dorsoventral male. 6, *D. bartoni*, ventral female terminalia.

tenuous, with the best feature being the well-defined small triangular sclerite associated with the genital sac (Fig. 4). An attempt to identify the male of *D. mimi-rogerorum* in the key given by Clayton et al. (1996) again has it coming out either as *D. carljonesi* or *D. hahnae*. The length of the genitalia, the other dimensions, and the number of sternal setae will aid in recognition. An error in this key should be corrected. In the second half of couplet 5 for *D. hahnae*, it is erroneously given that the genitalia length is equal to or less than 0.62 when it should actually read as being equal to or more than 0.62.

Etymology.—*Dennyus mimi-rogerorum* is named for the senior author's children, Miriam ("Mimi") Erickson-Clayton and Roger Clayton, who assisted in the capture of the birds from which these lice were collected.

Dennyus (Collodennyus) bartoni
Clayton, Price, and Johnson, new
species
 (Fig. 6)

Type host.—*Aerodramus mearnsi* (Oberholser), the Philippine swiftlet.

Female.—Head and thorax as in Fig. 5; abdomen, except for ventral terminalia, much as in Fig. 1. Tergal setae: I, 12; II–III, 12–13; IV, 14; V–VI, 13–14; VII, 12–14; VIII, 11–12; median setae of tergite IV long. Marginal sternal setae: II, 9–11; III, 10–13; IV, 11–13; V, 6; VI, 3–4; VII, 8. Anterior sternal setae: II, 6–8; III, 4–6; IV, 5–13; V, 0–2; VI–VII, 0. Setae in each brush on sternite V, 38–47; VI, 12–19; with posterior setae thinner and longer than others in brush. Total number of setae on sternite VI, 29–39. Subgenital plate (Fig. 6) with total of 25–27 setae in portion posterior to VII; with 14–17 marginal setae, not thicker than anterior setae and all in slightly irregular single row. Anal ventral fringe of 49–51 setae, dorsal of 39–42 setae; total of 7–8 short setae anterior to ventral fringe. Dimensions: temple width, 0.56–0.58; head length, 0.51–0.53; prothorax width, 0.34–0.35; metathorax width, 0.58–0.60; abdo-

men width at segment IV, 0.75–0.85; abdomen length, 1.81–1.88; total length, 2.79–2.92; anus width, 0.26–0.27.

Male.—Unknown.

Type material.—Holotype ♀, ex *Aerodramus mearnsi*, Philippines: Mindanao, Gudkidnom Prov., 4 May 1999, D. H. Clayton, SEA 116; in National Museum of Natural History, Washington, D.C. Paratypes: 2 ♀, same data as holotype.

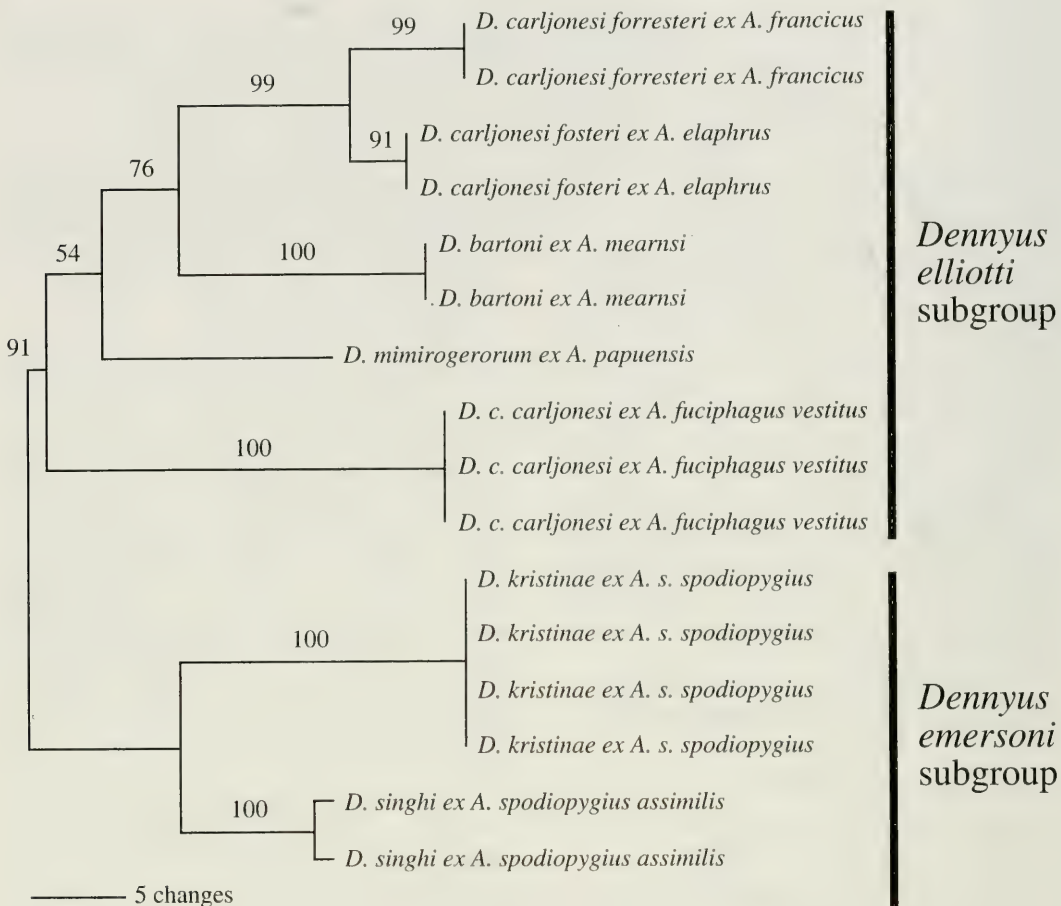
Remarks.—As with *D. mimi-rogerorum*, this new species belongs to the *distinctus* species group and the *elliotti* species subgroup as delimited in Clayton et al. (1996). The shape and chaetotaxy of the head as in Fig. 5, in conjunction with the chaetotaxy of the thorax and terminal abdominal segments, place *D. bartoni* in the *distinctus* species group. It is clearly a member of the *elliotti* species subgroup on the basis of the female having a few short setae displaced anterior to the ventral anal fringe and abdominal tergites II–VI each with not more than 14 setae.

The female of *D. bartoni* is separable from the other taxa in the *elliotti* species subgroup by the combination of its large dimensions, the ventral anal fringe with only 7–8 short setae displaced anteriorly to it (Fig. 6), sternite II with 6–8 anterior setae, sternite III with 4–6 such setae, sternites VI–VII without medioanterior setae, the posterior subgenital plate setae in a slightly irregular row of only 14–17 setae with longer setae medially (Fig. 6), and the anus with shorter ventral fringe setae (Fig. 6). The female identifies in Clayton et al. (1996) as for *D. mimi-rogerorum*.

Etymology.—*Dennyus bartoni* is named for the senior author's colleague Scott Barton, Reid Park Zoo, Tucson, AZ, in recognition of his long-standing friendship, enthusiasm, and support for research on birds and bird parasites.

PHYLOGENETIC RELATIONSHIPS

When Clayton et al. (1996) revised the species of *Dennyus (Collodennyus)*, they placed the 23 louse taxa, all of which are



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Fig. 7. Phylogenetic tree resulting from unweighted parsimony analysis of a 379 bp. portion of the mitochondrial cytochrome oxidase I (COI) gene for species of *Dennyus* in the *elliotti* subgroup. The tree is rooted on the *D. emersoni* subgroup as an outgroup, because phylogenetic analyses of morphological characters indicate that this subgroup is among the closest relatives of the *elliotti* subgroup (Clayton et al. 1996). Numbers above branches indicate bootstrap support from 1,000 replicates. Branch lengths are proportional to the number of nucleotide changes reconstructed on that branch (scale indicated). *D.* = *Dennyus*; *A.* = *Aerodramus*.

restricted to swiftlets (Apodidae: Apodinae), into 2 species groups: the *distinctus* group with 15 taxa in 3 subgroups and the *thompsoni* group with 8 taxa in 2 subgroups. The 2 new species described above are clearly members of the *distinctus* group, bringing the updated total of *distinctus* group louse taxa to 17. Based on morphology, *D. mimiogerorum* and *D. bartoni* can be further placed in the *elliotti* subgroup,

bringing the total number of taxa in that subgroup to 8, all parasites of the genus *Aerodramus*.

Analysis of a 379 base pair portion of the mitochondrial cytochrome oxidase I (COI) gene also supports the taxonomic and phylogenetic findings based on morphology (GenBank Accession numbers DQ139292–DQ139307). Phylogenetic analysis of COI sequences supports inclusion of *D. mimi-*

rogerorum and *D. bartoni* in the *elliotti* species subgroup (Fig. 7), and the monophyly of the *elliotti* subgroup is supported by 91% of bootstrap replicates. The COI sequence from *D. mimirogerorum* is 7.4–8.4% divergent (uncorrected pairwise divergence) from sequences of *D. carljonesi*. Sequences of *D. bartoni* are 7.1% divergent from *D. mimirogerorum*. These differences are as large as, or greater than, differences between other closely related *Dennyus* species. Material of *D. hahnae* from its type host, *Aerodramus hirundinaceus* (Stresemann), is not available for DNA sequencing, so no comment can be made on the divergence of either *D. mimirogerorum* or *D. bartoni* from *D. hahnae*. Molecular phylogenetic analyses of these new species (Fig. 7) also indicates that the subspecies of *D. carljonesi* do not form a monophyletic group, suggesting that consideration should be given to elevating these subspecies to full species.

ACKNOWLEDGMENTS

We thank Andy Mack, Avit Wako, Deborah Wright, and Ross Sinclair of the Wildlife Conservation Society for logistical assistance in PNG. We also thank Sarah Bush, University of Kansas, and Miriam Erickson-Clayton and Roger Clayton for assistance with the fieldwork. Financial support was provided by NSF grant DEB-0107947 to D.H.C., DEB-0107891 to K.P.J., and DEB-0118794 to D.H.C. and K.P.J.

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